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Two New Species of Trematodes from the Deep Sea Scorpion Fish, *Scorpaena madurensis* Cuv. & Val.

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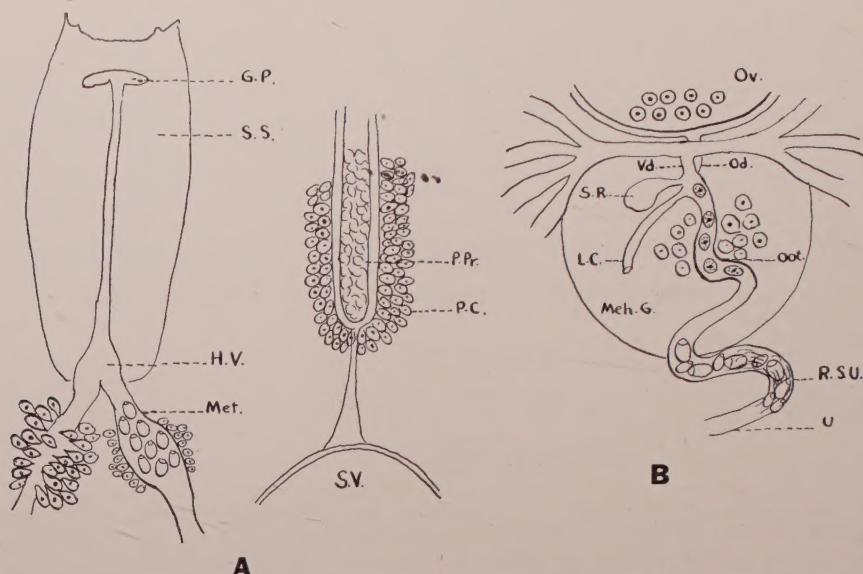
(Plate I; Text-figures 1 & 2).

Scorpaena madurensis (= *Sebastes madurensis*) inhabits the deeper waters off the Madeira Islands. Specimens were sent to the New York Aquarium in an exchange with the London Aquarium. Two species of trematode parasites belonging to the families Hemiuridae and Allocereidae were found in the stomach and intestine respectively. Morphological studies on these worms indicated that they were new and the names *Tubulovesicula madurensis* and *Podocotyle atzi* were given them by Nigrelli (1939).

Tubulovesicula madurensis.

(Plate I, Fig. 2; Text-figure 1).

The following description is based on four specimens. The worms are cylindrical, spindle shaped, and in all cases the tail portion was completely everted. Total length 7.35 mm.; tail appendage proper 2.69 mm. Width of worms, taken in the middle third of the body, 1.63 mm. Pre-oral lip and cervical glands present, the former measuring .0435 mm. in length. Oral sucker .251 × .287 mm., subterminal; pharynx contiguous to oral sucker, measuring .161 × .194 mm.; esophagus short, .111 mm. The proximal part of the ceca is lined with cuticula for a short distance, ceca terminating at the posterior tip of the tail appendage. Acetabulum larger than oral sucker, slightly forward in the anterior third of the body, measuring .643 × .659 mm. Testes ovoid in shape, ventral, post-acetabular, more or less obliquely placed, separated from one another by uterine coils. Right testis measures .444 × .498 mm.; left testis .413 × .532 mm. The seminal vesicle is short and broad, tubular, antero-dorsal to the testes, post-acetabular, measuring .465 × .165 mm. *Pars prostatica* long, surrounded by numerous prostate cells, post-acetabular, measuring 1.28 mm. in length. *Ductus hermaphroditicus* enclosed in a sinus sac and opening into the genital atrium. Sinus sac large, shield-shaped, measuring .150 × .270 mm. Opening of the atrium at the level of the pharynx. Ovary oval shaped, immediately behind the testes, measuring .348 × .442 mm. Seminal receptacle measures .042 × .032 mm. Laurer's canal present. Shell gland immediately posterior to the ovary, .233 mm. in diameter. Vitelline glands tubular, extending to the extra-cecal area, seven lobes in number, three left, four right, measuring 1.50 × .046 mm. *Receptaculum seminis uterinum* present. The uterus descends to the posterior end of the body but does not enter into the tail appendage, or only slightly so. It then winds anteriorly, mostly intercecal, to one side of the



Text-figure 1.

Reproductive organs of *Tubulovesicula madurensis*. **A.** Part of the terminal reproductive system. G.P., genital pore; S.S., sinus sac; H.V., hermaphroditic vesicle; Met., metraterm; P.Pr., pars prostatica; P.C., prostate cells; S. V., seminal vesicle. **B.** Ovarian complex. Vo., ovary; Od., oviduct; Vd., vitelline duct; S.R., Seminal receptacle; L. C., Laurer's canal; Oot., oocyte; Meh. G., Mehlis' gland; R. S. U., Receptaculum seminis uterum; U., uterus.

ovary, and in between the testes. The metraterm portion of the uterus measures .38 mm. in length. Eggs thick shelled, operculated and embryonated, measuring .012-.015 \times .018-.025 mm. The excretory stem bifurcates just immediately behind the level of the testes; the arms of the branches re-uniting at the level of the pharynx, on the dorsal side.

The genus *Tubulovesicula* was created by Yamaguti (1934) to include the following hemiurids: *T. spari* Yamaguti (1934) from *Sparus macrocephalus*; *T. anguillae* Yamaguti (1934) from *Anguilla japonica*; and *T. muraenesocis* Yamaguti (1934) from *Muraenesox cinereus*. The first of these species was designated as type. This investigator included in this genus *T. angusticauda* (Nicoll, 1915) (= *Ectenurus angusticauda* Nicoll, 1915) also from *Muraenesox cinereus*. According to Yamaguti, however, this species differs from the form that he described from the same host in the size of the eggs, and in the posterior extent of the seminal vesicula and the pars prostatica. Yamaguti further indicated in his paper that the form described by Layman (1930) as *Lecithaster lindbergi* also should be referred to the genus *Tubulovesicula*. Since then two other species have been included in the genus. Park (1936) described *T. californica* from the stomach of *Enophrys bison*, a sculpin fish from the west coast of the United States, and Yamaguti (1938) described *T. pseudorhombi* from *Pseudorhombus pentophthalmus*.

On the basis of the characters described for the genus by Yamaguti (1934) there can be no question that the hemiurids from the stomach of the scorpion fish, *Scorpaena madurensis* should be included in this group. The name *T. madurensis* Nigrelli (1939) was designated for this species and appears to be closely related to *T. pseudorhombi*. *T. madurensis* differs from

T. pseudorhombi in body size, size and extent of the seminal vesicle and *pars prostatica*, size and shape of the sinus sac, size, shape and extent of the vitellaria, amount of uterine coils and size of eggs.

The hemiurids comprise a large group of stomach parasites of marine fishes. As was pointed out by Looss (1907), Stunkard & Nigrelli (1934) and other investigators, these trematodes have powerful body muscles and are capable of contracting their body tremendously. Very great changes in the shape and spatial relations of the internal organs may be produced, especially when the caudal appendage is protruded or retracted. Comparisons between related worms should be made with care. Fortunately in this present group most of the worms described by the various authors were those with tail appendage fully extended and the following key could be employed to determine the recognized species.

KEY TO THE RECOGNIZED SPECIES OF *Tubulovesicula* YAMAGUTI, 1934.

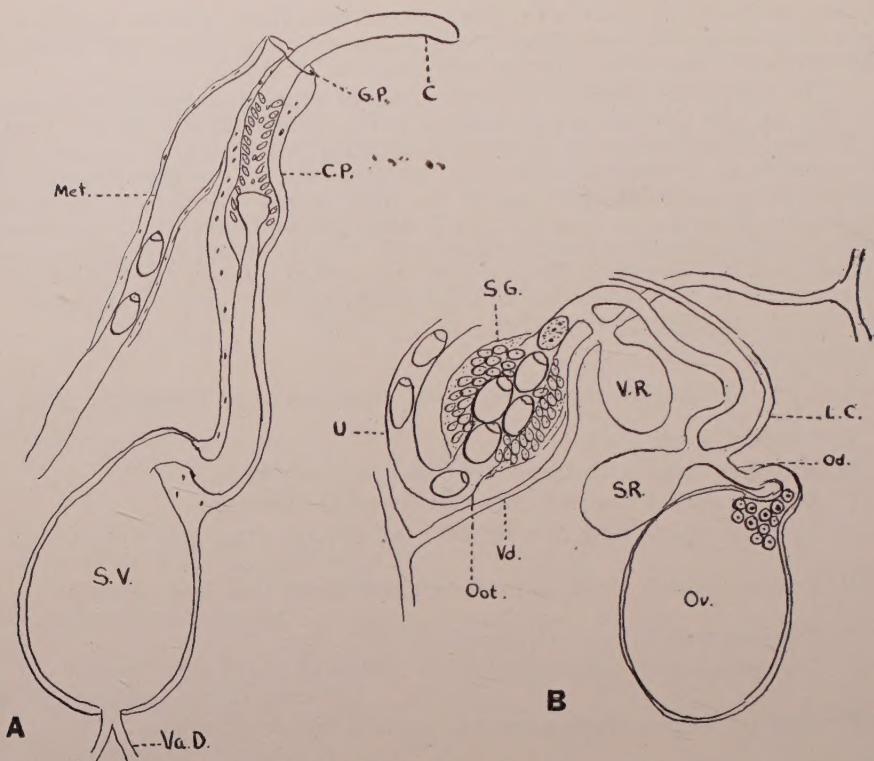
- A. Vitelline lobes 7 (3 + 4).
- B. Vitelline gland with three right and four left lobes.
- C. Uterine coils extending into tail for some distance.
- D. Seminal vesicle long and slender; tail shorter than body proper.....
 T. spari Yamaguti, 1934 (Type sp.).
- DD. Seminal vesicle short and slender; tail longer than body proper.....
 T. anguillae Yamaguti, 1934.
- E. Seminal vesicle long and broad.
- F. *Pars prostatica* originating at the middle of the acetabulum.....
 T. muraenesocis Yamaguti, 1934.
- FF. *Pars prostatica* originating posterior to the acetabulum.....
 T. lindbergi (Layman, 1930).
- EE. Seminal vesicle short and slender; *pars prostatica* originating at the level of the anterior border of the acetabulum.....
 T. angusticauda (Nicoll, 1915).
- BB. Vitelline gland with four right and three left lobes.
- G. Seminal vesicle long and slender; *pars prostatica* originating at the level of the anterior border of the acetabulum.....
 T. pseudorhombi Yamaguti, 1938.
- GG. Seminal vesicle short and broad; *pars prostatica* originating some distance posterior to the acetabulum.....
 T. madurensis Nigrelli, 1939.
- AA. Vitelline lobes 8 (4 + 4).....
 T. californica Park, 1936.

Podocotyle atzi.

(Plate I, Fig. 2; Text-figure 2).

The genus *Podocotyle*, according to Odhner (1906), is characterized as follows: "Body elongate, quite evenly wide, sometimes flattened and ribbon-like. Esophagus at most twice as long as pharynx, forking in front of the ventral sucker. Genital pore to the left, lying at the level of the esophagus. Excretory vesicle reaching to the ovary. Seminal vesicle long, coiled; *pars prostatica* lacking. Cirrus of marked length, straight. Ovary three-lobed. Vitellaria normally not reaching anterior to ventral sucker. Eggs without filament. In intestine of marine fish. Type species *P. atomon* (Rud.)."

Two worms were recovered from the intestine of *Scorpaena madurensis*, both measuring 4.41 mm. in length; width .707-.851 mm. Oral sucker .251 × .289 and .266 × .281 mm.; pharynx .205 × .167 and .190 × .152 mm.;



Text-figure 2.

Reproductive organs of *Podocotyle atzi*. A. Part of the terminal reproductive complex. C., cirrus; G.P. genital pore; C. P., cirrus pouch; Met., metraterm; S.V., seminal vesicle; Va. D., vas deferens. B. Ovarian complex. Ov., ovary; Od., oviduct; S. R., Seminal receptacle; L. C., Laurer's canal; V.R., vitelline reservoir; S.G., shell gland; Oot., ootype; Vd., vitelline duct; U., uterus.

esophagus $.294 \times .061$ mm.; ceca extending to the level of the posterior group of vitellaria; acetabulum, prominent, somewhat protruded, measuring $.519$ and $.590 \times .540$ mm. Testes sharply oblique, anterior testis $.255 \times .281$ mm. and $.296 \times .273$ mm.; posterior testis $.380 \times .243$ and $.327 \times .295$ mm. Ovary immediately in front of anterior testis, non-lobulated, measuring $.152 \times .190$ and $.203 \times .160$ mm. Seminal vesicle, slightly coiled, $.380 \times .167$ mm. and $.319 \times .152$ mm. Cirrus long and narrow, $.532 \times .053$ mm.; pars prostatica lacking; genital pore at the level of cecal bifurcation, to the left. Ovarian complex consisting of seminal receptacle, vitelline reservoir and shell gland. Laurer's canal present. Vitellaria mostly extra-testicular and extra-cecal, extending anteriorly to the level of the posterior border of the acetabulum and posteriorly to a short distance from the tip of the body. Uterine coils, intercecal, few, limited to area between the anterior border of the ovary and posterior border of the seminal vesicle. Eggs few, operculated, embryonated, measuring $.038 \times .062$. Excretory vesicle extending to level of the posterior testis and arms extending slightly anterior to the level of the bifurcation of the ceca, terminating on each side of the esophagus.

From the above description there can be no doubt that the allocreadiids from the intestine of the Madeira scorpion fish belong to the genus *Podocotyle*. The present species designated as *P. atzi* Nigrelli (1939)

differs from other recognized species in body size, size of the eggs, esophagus-pharynx size relationships, size and relationships of the seminal vesicle, extent of the excretory branches, predominance of the acetabulum, shape of the ovary, and nature of the ovarian complex.

SUMMARY.

1. Two species of trematodes from the stomach and intestine of the Madeira scorpion fish, *Scorpaena madurensis*, are described.
2. The stomach parasites belong to the family Hemiuridae Lühe and were named *Tubulovesicula madurensis* by Nigrelli in 1939. The intestinal parasites belong to the family Allocreadiidae Stossich and were designated *Podocotyle atzi* by the same author.
3. A key to the species of *Tubulovesicula* Yamaguti (1934) is given.

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EXPLANATION OF THE PLATE.

Photographs made by direct projection of specimens on bromide paper.
Worms stained with Delafield's hematoxylin.

PLATE I.

Fig. 1. *Tubulovesicula madurensis*. $\times 22.7$.
Fig. 2. *Podocotyle atzi*. $\times 29$.



FIG. 1.

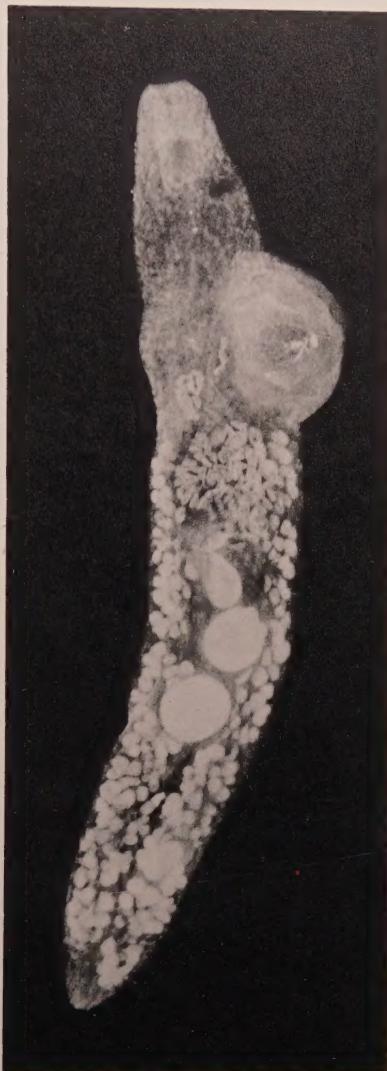


FIG. 2.

TWO NEW SPECIES OF TREMATODES FROM THE DEEP SEA
SCORPION FISH, *SCORPAENA MADURENSIS* CUV. & VAL.

